Comparing the performance of experts and novices in a virtual reality Endoscopic Retrograde Cholangiopancreatography (ERCP) simulator.

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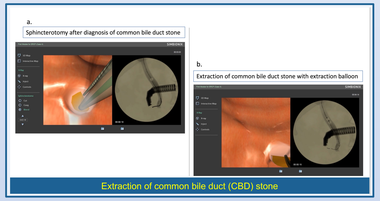
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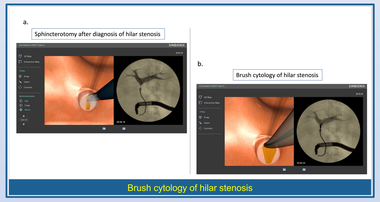


Background

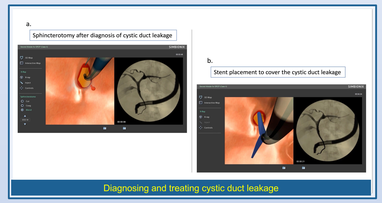
There is a lack of evidence regarding the effectiveness of virtual simulators to acquire hands-on exposure to Endoscopic Retrograde Cholangiopancreatography (ERCP). The aim of the present study was to assess the outcome and construct validity of virtual ERCP when training on the GI Mentor II simulator.



Extraction of common bile duct (CBD) stone



Brush cytology of hilar stenosis



Diagnosing and treating cystic duct leakage

Methods

Seven experienced endoscopists were compared with 31 novices. After a short introduction, they were requested to carry out three virtual ERCP procedures: removing a common bile duct stone, taking brush cytology from a hilar stenosis, and treating a cystic leakage with a bile duct stent. For each task, total time for task completion, time required to view the papilla, total irradiation time, time to deep cannulation, time to define diagnosis, time to complete sphincterotomy, and time to complete the respective intervention were measured. Bile duct cannulation, correct diagnosis, sphincterotomy and time to complete intervention were independently assessed by an assessor blinded to the performing endoscopist.

Table 1. Demographics and Characteristics of the Two Groups

		Experts (N)	Students (N)	p
Sex	Females	0	16	0.0125
	Males	7	15	
Age (years)	40+	3	9	0.3653
	30-40	4	15	
	20-30	0	7	
Specialist	Yes	7	24	0.1639
	No	0	7	
Number of video gastroscopies carried out	500+	7	20	0.1741
	200-500	0	8	
	100-200	0	0	
	up to 100	0	3	
Number of video colonoscopies carried out	500+	7	14	0.0736
	200-500	0	5	
	100-200	0	4	
	up to 100	0	8	
Number of polypectomies carried out	100+	6	11	0.0365
	50-100	1	5	
	up to 50	0	15	
Experience from video games	Yes	6	15	0.0728
	No	1	16	

Table 2. Parameters measured in bile duct stone removal (ERCP Module 1, Case study 4)

Parameters	Experts		Novices		P
	Mean	SD	Mean	SD	
1. Total time (s)	273	38	273	83	0.999
2. Time to view papilla correctly (s)	89	29	124	45	0.023
3. Total time of X-ray (s)	27	11	31	16	0.471
4. Time to deep cannulation (s)	127	27	160	54	0.028
5. Time to diagnosis (s)	139	29	167	54	0.068
6. Time to sphincterotomy (s)	173	31	192	60	0.249
7. Time to complete intervention (s)	238	35	246	80	0.661

Results

Time required to visualize the papilla and to cannulate deeply when removing bile duct stone was significantly shorter for the experts (both $p<0.05$). Time to visualize the papilla, cannulate deeply, reach diagnosis, complete sphincterotomy and complete intervention was significantly shorter for the experts when managing cystic leakage (all $p<0.05$). In diagnosing and brush cytology from a hilar stenosis the experts needed less time for deep cannulation of the bile duct ($p=0.077$).

Table 3. Parameters measured in hilar stenosis (ERCP Module 1, Case study 2)

Parameters	Experts		Novices		P
	Mean	SD	Mean	SD	
1. Total time (s)	214	44	221	53	0.729
2. Time to view papilla correctly (s)	99	38	121	35	0.181
3. Total time of X-ray (s)	22	6	23	12	0.960
4. Time to deep cannulation (s)	116	41	151	41	0.077
5. Time to diagnosis (s)	129	42	157	42	0.141
6. Time to sphincterotomy (s)	148	45	171	45	0.240
7. Time to complete intervention (s)	180	44	198	50	0.370

Table 4. Parameters measured in cystic leakage (ERCP Module 2, Case study 4)

Parameters	Experts		Novices		P
	Mean	SD	Mean	SD	
1. Total time (s)	304	155	252	64	0.415
2. Time to view papilla correctly (s)	80	31	124	35	0.008
3. Total time of X-ray (s)	46	53	28	16	0.410
4. Time to deep cannulation (s)	77	33	149	42	<0.001
5. Time to diagnosis (s)	89	38	170	49	0.001
6. Time to sphincterotomy (s)	106	39	186	53	0.001
7. Time to complete intervention (s)	154	60	226	57	0.018

ENDO Mentor Suite - GI Mentor platform

(adapted from Endo mentor User Guide October 2021,10-GIUG-W1021-004)



1	27" touch screen
2	GI interchangeable cartridge
3	Wireless keyboard and mouse
4	Scope hanger
5	Scope connectors
6	Elevation mechanism
7	Computer activation button
8	Rotating tool tray
9	Upper drawer
10	Lower drawer for Colonoscope, Duodenoscope, etc
11	Foot switch

Conclusion

The performance differed between experts and novices, especially in the management of cystic leakage. This corroborates the construct validity of the simulator used.

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